Effect of elastic strength training on selected physical fitness variables of novice college men high jumpers

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Abstract: The aim of the present study was to find out the effect of elastic strength training on selected physical fitness variables of novice college men high jumpers. To achieve the purpose of the study, thirty novice male high jumpers were selected randomly from Department of Physical Education and Sports Sciences, Annamalai University, Chidambaram. The selected subjects were classified into two groups of fifteen each. Group I underwent eight weeks of elastic strength training programme, so as to be an experimental group. Group II acted as control group to find out the influence of elastic strength training programme. The criterion variables selected for the present study are speed – 50 meters dash, leg strength – leg dynamometer and explosive power – vertical jump. The elastic strength training group underwent training 3 days per week for eight weeks. They performed 50 to 80 foot contacts per session. The training resulted in significant improvement in speed ($F = 35.24$, $p < 0.05$), leg strength ($F = 47.47$, $p < 0.05$) and explosive power ($F = 19.62$, $p < 0.05$). It is concluded that novice high jumpers experience significant improvement in lower extremities strength and power.

Keywords: *Elastic strength, high jumpers, speed, power, dynamometer*

Introduction

The ability to jump high is important in high jump. Therefore, an increased knowledge about factors limiting vertical jumping ability is of interest for both coaches and athletes. A common experience among coaches is that up to a certain degree almost any type of training program will increase the vertical jumping capacity which enhances high jump performance. However, an increased performance level of the athlete will require more specific and individually adapted training methods [1].

In this age of specialization in athletics, the strength requirements of the jump events, demand debate about maximum strength, strength endurance and *elastic strength.* The adjective *"elastic"* is particularly appropriate since muscles possess high elasticity. Muscles are composed of contractile elements (actin and myosine) and elastic elements that are in parallel and in series. The neuromuscular system accepts and expels rapid loading at high velocity through the coordination of both *reflexes* and these *elastic* and *contractile* components of muscle. Due to these facts the definition of "elastic strength" occurred: (the ability of the neuromuscular system to overcome resistance with a high speed of contraction). Using the jumping events as an example, coaches were aware that a pre stretch state had to precede the muscle work or flexion state of the muscles for the stretch reflex to work, so the idea of pre-tensing the leg muscles of the plant foot just before the foot landed in the plant phase of jumping became the norm [1]. Gradually jump events stated inculcating elastic strength training in their regular training schedule. The aim of the present study was to find out the effect of elastic strength training on selected physical fitness variables of novice college men high jumpers.

Methods

Subjects

Subjects and variable

To accomplish the purpose of the study thirty novice male high jumpers were selected randomly from Department of Physical Education and Sports Sciences, Annamalai University, Chidambaram, Tamilnadu. The selected subjects were classified into two groups of fifteen each. Group I underwent eight weeks of elastic strength training programme, so as to be an experimental group. Group II acted as control group to find out the influence of elastic strength training programme. The criterion variables selected for the present study are speed – 50 meters dash, leg strength – leg dynamometer and explosive power – vertical jump. These subjects were tested before and after eight weeks of training.

Training

The elastic strength training group underwent training 3 days per week for eight weeks. They performed 50 to 80 foot contacts per session (Table 1).

Table 1
Elastic strength training Programme for novice high jumpers

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Volume	**50 FC**		**60 FC**		**70 FC**		**80 FC**	
Exercises	Squat jumps 1x10		Squat jumps 1x10		Squat jumps 1x10		Line hops 3x10	
	Multiple long jump 5x3		Split squat jump 2x5		Split squat jump 3x5		Ankle hops 1x10	
	Lateral long jump 5x1		Tuck jump 5x1		Multiple cone hops 5x3		Cone hops 2x5	
	Pike jump 5x1		Lateral long jump 5x1		Lateral long jump 5x1		Squat jumps 2x5	
	Two leg jump/reach 5x1		Weighted squat jump 10x1		Weighted squat jump 10x1		Split squat jump 2x5	
	Single leg jump/reach 5x1		Box jump 2x5		Box jump 2x5		Long jump 5x1	
	18 inch depth jump 5x1		12 inch depth jump 10x1					

FC – Total Foot contacts per training session as determined by total sets and repetitions for that session

Statistical technique

The experimental design used for the present investigation was Analysis of Covariance (ANCOVA). Since two groups are involved post hoc test was not applied to determine the significant paired mean differences. The level of confidence was fixed at 0.05 to test the significance. The data was analysed in computer system by using statistical package for social science (SPSS) version 17.

Results

It is clear from the table 1 that there is no significant difference between elastic strength training and control group on speed, leg strength and explosive power before commencement of training. However, there is a significant difference on speed ($F = 5.58$, $p < 0.05$), leg strength ($F = 7.61$, $p < 0.05$) and explosive power ($F = 8.01$, $p < 0.05$) during post test. Thereby it inferred that the elastic strength training significantly improved selected physical fitness variables in novice male high jumpers.

Table 1
Summary of ANCOVA on aerobic capacity

Variables	Testing Conditions	Elastic Strength training	Control group	SOV	SS	df	MS	*F*
Speed (sec)	Pre (M ± SD)	7.49±0.37	7.53±0.41	B	0.011	1	0.011	0.07
				W	4.287	28	0.153	
	Post (M ± SD)	6.87±0.36	7.52±0.42	B	0.837	1	0.837	5.58*
				W	4.195	28	0.150	
	Adjusted (M)	7.07	7.53	B	0.005	1	0.005	35.2*
				W	0.004	27	0.0002	
Leg Strength (kg)	Pre (M ± SD)	46.20±6.07	46.25±5.21	B	0.01	1	0.01	1.07
				W	0.24	28	8.43	
	Post (M ± SD)	50.21±6.42	46.95±4.99	B	0.213	1	0.213	7.61*
				W	0.776	28	0.028	
	Adjusted (M)	50.03	46.91	B	1121.2	1	1121.2	47.7*
				W	637.85	27	23.62	
Explosive power (cm)	Pre (M ± SD)	27.33±2.72	27.40±2.53	B	0.033	1	0.033	0.005
				W	192.93	28	6.89	
	Post (M ± SD)	35.73±6.36	28.53±4.51	B	76.80	1	76.80	8.01*
				W	268.67	28	9.60	
	Adjusted (M)	34.13	27.86	B	79.72	1	79.72	19.6*
				W	109.69	27	4.06	

*Significant at 0.05 level of confidence

Further, table 1 clearly shows that after adjusting pre-test scores, there was a significant difference between the two groups on adjusted post test scores on speed ($F = 35.2$, $p < 0.05$), leg strength ($F = 47.7$, $p < 0.05$) and explosive power ($F = 19.6$,

$p < 0.05$). Thus, it is concluded that eight weeks of elastic strength training significantly improved speed (8.27%), leg strength (8.67%) and explosive power (30.73%) than control group.

Discussion

Leg strength is the primary source of power in many sports. According to Gambetta (2007) the legs can be seen as a functional unit of a closed kinetic chain without which an athlete cannot have speed, strength, power or suppleness to perform [2]. In the present study 8.67% of improvement is elicited in leg strength as result of elastic strength training. Since, leg strength significantly influences high jumpers speed and explosive power which may enhance their jumping performance. Hence, it has been shown that muscular strength is related to sprinting performance [3]. Speed and explosive power significantly improved as a of elastic strength training. This finding is in accordance with Thomas, French & Hayes, (2009), Sáez-Sáez De Villarreal *et al.,* (2009), Markovic & Mikulic, (2010), Sáez-Sáez De Villarreal *et al.,* (2010) [4-7]. In the present study the changes are elicited in selected physical fitness variables may be because of effective elastic strength training programmes with optimal level of novice high jumpers that enhanced both neural and muscular characteristics [8].

Conclusion

It is concluded that elastic strength training programme for 8 weeks is effective in improving the novice male high jumpers performance on speed, leg strength and explosive power. This optimal training load may be adopted during preparation of novice high jumpers who require greater amount of leg strength, speed and explosive power to jump higher.

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